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ENGEL expands

It is often the way with forecasts that things turn out quite differently. We have not seen such a surprisingly strong and long-lasting growth since the dawn of industrialisation.

ENGEL has benefited from this growth more than most: we have steadily increased our share across all regions and markets. The trust that you, our customers, place in us is a source of satisfaction and honour – and a major incentive to keep improving. Although this development itself is positive, we know that as a result you are having to wait a long time for the machines and system solutions you have ordered – and we find that unacceptable. The issue of delivery times is one that concerns me greatly. We are doing everything in our power to accelerate our expansion measures with the cooperation of our suppliers. From Schwertberg to St. Valentin, Shanghai and Kaplice, we are building at almost all production sites to significantly expand our capacities. It has been three years since we embarked on a record programme of investment. Since then, we have been continuously adapting our plans and priorities to the new reality – all with the aim of re-establishing a reasonable supply timeframe as quickly as possible.

The new production facility in St. Valentin went into operation at the end of June, shortly before trend.scaut. To coincide with the automobile conference, we opened the new hall to visitors for the first time. It is not only our production plants that are expanding, but also our sales and service offices. In May we formally opened our substantially expanded subsidiary in Hanover. With an interactive technology centre and enlarged training facility, the subsidiary points the way forward for our company. The accelerating integration of production processes, networking and digitalisation are creating a greater need for information and consulting. Today, we are working much more closely with many of our customers than we did just a few years ago, and this is increasing across the entire lifecycle of machines and systems. With this in mind, we are in the process of expanding sales and service teams worldwide while strengthening our technological and industry expertise at the local level.

Proximity to the customer is our most important value, and will remain so. To us, proximity means more than short distances and a minimum number of interfaces; it means a complete understanding of your needs, a shared mindset and, ultimately, solidarity.
ENGEL worldwide. around the corner.
Fairs, events, projects

ENGEL is expanding worldwide
More employees, more production capacity

ENGEL Hannover reopens after refurbishment
Well equipped to meet future requirements

Automotive future moving closer
Techtalk on the occasion of ENGEL trend-scout
with Franz Füreder, Michael Fischer and Peter Egger

Performance and precision – layer by layer
Thermoplastic Tapes Require New Processing Technologies

Welcome to the ENGEL stand at Fakuma 2017
Industry Competence in Action

Short paths to process optimisation
ENGEL presents comprehensive inject 4.0 programme at Fakuma

Bringing process monitoring to the next level
iQ weight monitor is standard as of Fakuma

Teamwork spanning three continents
e-connect.24 ensures top machine availability for Huf worldwide

Strong machines with sensitivity
Faway in China produces high quality components for vehicle interiors using duo machines

Prefillable syringes made of COC
– a niche market with potential
SCHOTT in Switzerland invests in highly integrated sytem solution
ENGEL worldwide. around the corner.

More than 200 guests attend lightweight construction symposium in UK

In partnership with Jaguar Land Rover, ENGEL invited guests to the two-day event at its Warwick subsidiary. Presentations and discussions focused on innovative composite solutions for mass production. Aside from those representing JLR and ENGEL, speakers came from Nissan, DuPont and Lanxess, automotive suppliers CCP Gransden and Formaplex, as well as the Warwick Manufacturing Group. Graeme Herlihy, Managing Director at ENGEL UK, emphasised the major opportunities for the injection moulding industry presented by the trend for lightweight construction. In his talk, Mark Ellis of Nissan spoke of the interplay between design, material and the finishing process, which is critical in terms of meeting the lightweight construction challenges of the mass automobile market. He also emphasised that it is still necessary to develop new processes for the recycling of composite parts. The Warwick Manufacturing Group, which runs an ENGEL v-duo 1700 machine with integrated HP-RTM equipment in its Automotive Composite Research Centre at the University of Warwick, and CCP Gransden, which is currently moving into the mass production of composite parts, reported on their own experience. In breaks between presentations, ENGEL used an ENGEL insert 130 vertical machine to demonstrate how innovative lightweight construction technologies can be implemented in practical situations.

Honoured for commitment to Upper Austria

ENGEL AUSTRIA is the winner of the Corona 2017 prize in gold. With this award, the Federation of Industry for Upper Austria has honoured the strong commitment of ENGEL at its headquarters in Schwerberg. The Corona 2017 award was presented in two categories. ENGEL won first prize in the category Location. Explaining its decision, the jury says: “ENGEL has increased its workforce in Upper Austria by 16 per cent in two years and has invested a particularly large amount of money in the expansion and modernisation of its headquarters. It has therefore made a lasting contribution to strengthening Upper Austria as a business location.” “ENGEL’s continuous growth is based on our innovative capacity and this is largely dependent on the general conditions in the region. Here in Upper Austria we benefit from a very good climate for innovation,” stresses Joachim Metzmacher, the CPO of ENGEL who accepted the award. In the last three years alone, ENGEL has invested 55 million euros in Upper Austria. The next steps will be the expansion of assembly capacity and the construction of a new customer technology centre.

“We are delighted with the award and particularly pleased that our commitment is not only recognised and appreciated by our staff and customers, but also by the whole region.”

Joachim Metzmacher, CPO of ENGEL

Top marks for Shanghai apprentices

In 2013, ENGEL started training its next generation of skilled professionals in China. Now, in June 2017, the first apprentices from ENGEL Machinery Shanghai have completed their final examinations – and passed
with flying colours. “Seven of the eight trainees passed with distinction,” reveals Werner Wurm. The man who oversees global apprentice training at ENGEL was particularly satisfied by the fact that apprentices in China were tested to demanding Austrian standards. “To us, this excellent set of results is an important validation of our international training concept,” says Wurm.

“If they are to produce goods to a uniformly high standard in our factories, our employees must be trained to a consistent high standard.” All eight of the new machining technicians will be offered permanent employment. At present, 45 young men are working in the training workshops of ENGEL Machinery Shanghai. ENGEL has managed to expand its training programme in China faster than planned. Plastics technicians and machining technicians are now trained in Shanghai alongside mechatronic technicians. “For WIFI International, this project is an example of best practice in terms of the ability of Austrian companies to offer dual training even in the face of a changing cultural, linguistic and legal landscape. In this way, companies can make sure that they have skilled personnel on hand when they have a demand, and that the skills acquired meet their specific and individual requirements,” emphasises Anton Aufner, head of WIFI International, partner to ENGEL in further education and training.

**ENGEL marks 25 years in the Czech Republic**

Together with 300 customers and partners, ENGEL celebrated the 25th anniversary of its sales and service subsidiary in Prague. Petr Stibor, Managing Director of ENGEL CZ, thanked customers for the positive working relationships and long-standing loyalty that have contributed greatly to the success of the branch. After Germany and the United States, ENGEL CZ is the third largest sales office in the Group. “You are an integral part of the ENGEL Group,” said Dr. Christoph Steger, Sales Director at ENGEL, addressing the ENGEL team in the Czech Republic as he conveyed the thanks and best wishes of the entire owning family.

For two days, customers took part in a wide-ranging programme of presentations and expert discussions at the branch’s recently renovated and expanded premises. The anniversary programme kicked off with a festive evening of Czech beer, food and live music at the Smíchov brewery.
ENGEL: Among the most family-friendly companies

ENGEL is one of the most family-friendly companies in Austria, a distinction presented by the editorial team of Woman magazine. In partnership with the Statista statistics portal and the recruitment site kununu, the magazine analysed staff evaluations and published a list of the 200 most family-friendly companies in Austria. The evaluation criteria included the willingness of employees to recommend the employer on grounds of family-friendliness as well as staff evaluations on matters such as working hours, remuneration, career prospects and the extent to which family and professional life can be balanced.

A year ago, ENGEL opened a toddlers’ group to look after infants at its Schwertberg headquarters in Upper Austria – just one of many aspects of family-friendliness that were highly rated by ENGEL employees. “These days, a big company like ENGEL is expected to do everything possible to ensure work and family life can be balanced, and rightly so,” says Carina Straßmayr, head of recruiting and recruitment marketing at ENGEL. In addition to the toddlers’ group, flexible working time is particularly important; ENGEL also offers flex-time in certain production areas.

ENGEL staff claim Ernst Schmitz prize again

Joachim Kragl, head of application technology at ENGEL Machinery Inc. in the USA, has been awarded the Ernst Schmitz prize for 2017 by the GFKT, the Austrian association for the promotion of plastics technology. In awarding the prize, the company has recognised his services to the harmonious interplay of people and technology.

For 25 years, plastics technician Joachim Kragl has worked in development and application technology at ENGEL. In his current position as Director Advanced Injection Molding Systems & Processing, he oversees application technology for ENGEL Machinery Inc. in York, PA. Here he meets the day-to-day challenge of translating specific customer requirements into technical solutions, communicating complex technologies and processes in a clear manner and supporting ENGEL’s customers with practical implementation.

Joachim Kragl is the third recipient of the Ernst Schmitz prize to come from ENGEL. Peter Pokorny, head of application technology at the company headquarters in Schwertberg, was honoured in 2002 while Andreas Steurer, head of application technology at the large-scale machine manufacturing plant St. Valentin, claimed the award in 2014.

Czech President Miloš Zeman visits ENGEL in Kaplice

As part of a three-day tour of South Bohemia, Czech President Miloš Zeman paid a visit to ENGEL’s production plant in Kaplice along with delegates and many
“Our employees were delighted that President Zeman devoted so much time to their questions and repeatedly praised the positive economic development of ENGEL. That is a great source of motivation.”

Taking the smart factory to Chinaplas

With inject 4.0, ENGEL helps injection moulding companies in global markets take full advantage of the opportunities presented by the fourth industrial revolution. ENGEL’s stand at the Chinaplas 2017 fair in Guangzhou revealed what form the first steps towards the smart factory might actually take. “Over the past year or two there has been a lot of hype in China about 4.0, everyone has been talking about it. Now we are reaching the mature stage,” says Gero Willmeroth, Director (Sales and Service) at ENGEL Machinery Shanghai. In other words, the main pioneers can already point to some initial success and even smaller businesses are working on concrete ideas as to how they can realise new possibilities.”
Growth is being driven from every corner of the globe, coinciding with the worldwide trend of increasing demand for integrated and automated system solutions. Developing made-to-measure injection moulding solutions calls for a depth of technological expertise and an understanding of the sector. For this reason, ENGEL is in the process of introducing the business unit structure established many years ago in Austria to both America and Asia. The first step was to appoint divisional heads for the five business units in North America. In Asia, ENGEL is currently reorganising its sales and distribution operation.

In the after-sales business, new possibilities from remote maintenance to condition-based predictive maintenance are leading to an ever closer collaboration between ENGEL and its customers creating the need for an even more close-knit network of service technicians. ENGEL currently has about 6,000 employees around the world, more than at any time in the company’s history.

More employees, more production capacity
As was the case last year, ENGEL will invest more than 100 million euros this business year in expanding and modernising its factories. One of the main expansion projects is the headquarters in Schwertberg. Construction started in May at the north section of the premises, next to the main entrance. The old administration building will make way for an extension of the production hall built in 2013, and, in a later stage of construction, the technology centre for customers will be moved above the new section. It will be significantly larger than the existing centre in order to present an even wider selection of injection moulding machines and technologies.

The sites in Schwertberg, Shanghai and St. Valentin will soon offer visitors a glimpse of the future.
ENGEL Hannover reopens after refurbishment

Together with over 200 guests, ENGEL opened its much extended and modernised subsidiary in Hannover. ENGEL invested around 5 million euros in the location.

Construction continued into March 2017 and lasted twelve months. The entire ENGEL Hannover team had moved to a free adjacent industrial building since the refurbishment was very extensive, resulting in a doubling of floor space. A total of 2,400 square metres is now available for the office wing, training centre and the technology centre. The building has two floors covering the entire footprint and even the event and training area is now on two floors. Christopher Vitz, managing director of ENGEL Deutschland GmbH at the Hannover location, is delighted with the new building and especially the new possibilities it offers. “Everything was completed on time to start operations,” he says. Founded in 2000, space had become a premium at the most northerly of the four German subsidiaries over the last few years. “Germany has grown quite considerably,” says Vitz. “Now that we have the extension, we can meet this growth head-on and it also means we are even better equipped to meet current and future customer requirements.”

Technology centre and training centre extended

The driving forces behind technology growth in Germany include lightweight composites, continuing increases in process integration and Industry 4.0. These trends make manufacturing processes more complex and it requires more and more intensive collaboration between ENGEL and plastics processors. “We not only act as suppliers but also increasingly as partners for continuous process optimisation over the entire service life of injection moulding machines and manufacturing cells,” explains Vitz. “As a result our aim here at the new subsidiary is to provide even better support to speed up the current and future technological change.” This is why the technology centre and the training centre were extended and given a new focus. “One factor that is particularly important for us is that the technology centre should be regarded not merely as a showroom but as an interactive technology centre,” says Vitz.

inject 4.0 and lightweight construction for trying out and understanding

In addition to alternating the exhibits, two themes are a standard fixture in the new interactive technology centre: inject 4.0 and lightweight construction. Under the term inject 4.0, already today ENGEL offers its customers several software products and services for the digitalisation and networking of injection moulding processes. For example, the intelligent assistance systems of iQ weight control and iQ clamp control have become very well established. During the opening ceremony in Hannover, ENGEL clearly demonstrated these functionalities on a self-optimising injection moulding machine.

ENGEL is already an important partner in the development of lightweight construction solutions for large automobile manufacturers, some of whom have their plants in the immediate vicinity of Hannover. Project managers and lightweight construction specialists work at ENGEL in Hannover and are therefore available locally to work on customer projects.

The first visitors to the new subsidiary are also impressed by the new training centre which is built with a state-of-the-art infrastructure. Experts from all regions of the world can tune in live by video conference. Courses which are regularly on offer include machine operation and process optimisation as well as workshops and seminars on the latest topics. What is new is that ENGEL Hannover now offers training courses to cater for specific target groups.

“We invite our customers to experience innovative developments live here in our new interactive technology centre and even try them out.”

Christopher Vitz, managing director, ENGEL Germany
The list of participants in trend.scaut 2017 sounds like the who’s who of the international automotive industry. More than 500 development and production managers, chief executives and market analysts discussed trends and challenges during the two-day conference in Linz and St. Valentin in late June, presenting the latest technologies and sharing visions of the future.

Mr Füreder, Mr Fischer, Mr Egger, what is your personal conclusion on ENGELO trend.scaut 2017?

FRANZ FÜREDER: No matter what trends assert themselves, trend.scaut 2017 has definitely confirmed one thing: Plastics – and especially injection moulding – are gaining massive importance in vehicle construction. Plastics are a lightweight material in their own right, and injection moulding is the ideal technology to combine lightweight design with cost efficiency. The process integration that injection moulding allows is the enabler for economically efficient large series processes.

PETER EGGER: I can only confirm that. I see a huge potential and, at the same time, the absolute necessity to research even more intensively in this direction. Global warming of 6 degrees threatens to become reality by the year 2050. In major Asian cities, people already need to wear respiratory protection many days of the year. All this makes the explosive nature of the topic clear, and there can be no doubt that plastics and injection moulding make a huge contribution to more sustainable mobility.

MICHAEL FISCHER: Another aspect that trend.scaut made clear was the change in the supplier structure. On the one hand, we have plastic processing companies in Asia who are developing away from the extended workbench and towards a designer role among peers. And on the other, electric mobility and autonomous driving are seeing new players enter the market which have so far not had anything to do with automotive.

What do these changes in the supplier structure mean for established companies in the industry?

FÜREDER: It is conceivable that data management will be more important in the automotive industry of the future than actual vehicle construction. Consequently, companies such as Google, Amazon, and Apple will suddenly be playing an important role. But it is also clear that you still have to build the vehicles, and the established suppliers do that best. It will be exciting to see who is in charge in the future. This is about know-how, but also about access to markets. I assume the future will bring even higher levels of cooperation.

FISCHER: I think the opportunity for the established providers lies in the fact that cars are an emotional product, in which safety plays a major role. The established suppliers have proven that they can implement safety aspects well. Based on this, they will enjoy greater trust than the new suppliers for quite a while.

The proportion of plastic in the vehicle is continuing to grow. Which areas are driving this development?

EGGER: If we look at the vehicle interior, autonomous driving is an important innovation driver. So far everything revolves around the driver seat, the classic cockpit. In the future, drivers might also be able to turn around, or sit in the rear. This means controls will be located in different areas in the interior and, because the feel-good factor is important, they will have to blend inobtrusively with the design. The focus is shifting to transparent materials, capacitive electronics and touch functions.

FISCHER: The future diversity of drive technologies will also lead to new moulding applications. The door openers here are thin-wall technology, the processing of thermoplastic fabrics and composite fibre materials with oriented structures that help to optimise the achievable degree of efficiency. At the same
time, diversity requires greater flexibility in production. Model diversity needs to be achieved economically.

But model diversity is only half the story. Reductions in stocks and increasingly decentralised production mean that batch sizes are becoming smaller. How are you adapting your approach?

FÜRDER: Fast mould changes are one solution. From good part to good part in one minute, that is the objective. In addition, industry 4.0 offers us massive opportunities. If a customer manufactures the same product at several locations around the world, we can help them achieve consistently high quality, even if the machine operators at these locations have different levels of qualification. This is possible thanks to intelligent assistance systems that allow the manufacturing processes to continuously self-optimise.

FISCHER: In production planning and service, increasing digitisation and networking are also helping us become more flexible and efficient. Thanks to online support, for example, we can maximise the availability of production equipment. At the same time, we are also strengthening our service teams by hiring new employees. We are becoming more of a partner throughout the entire service life of the system.

A number of innovative technologies were presented at trend.scaut. Which technologies are currently of particular importance?

EGGER: In lightweight design, it is mainly the organomelt technology for the shaping and functionalisation of continuous fibre reinforced thermoplastic semi-finished products that is making the headlines. In this area, there will be several new production launches in the near future. This technology is interesting not least because of its thermoplastic approach which simplifies the recycling of end-of-life components. Sustainable mobility also means thinking in closed-loop material circles. In the field of reactive processing, in-situ polymerisation of ε-caprolactam offers such a thermoplastic approach. We have laid the foundation for automotive series production with the automated production cell presented in St. Valentin. We are now ready to start developing the components in collaboration with the automobile manufacturers.

FISCHER: In terms of the interior, the challenge is to combine high-quality surfaces with flexibility and efficiency. The focus is shifting to IM for this, and we are taking it one step further with our DecoJect technology. The combination of injection moulding with IMG (in-mould graining) in a highly automated process makes a significant contribution to the harmonisation of interior surfaces in the vehicle. There was a significantly high interest in this process by trend.scaut attendees.

What other factors will drive competitiveness in the future?

EGGER: I am convinced that it will be even more important in the future to collaborate closely with OEMs and tier suppliers in advance engineering. This is why we are committed to research centres and competence centres, like the Open Hybrid LabFactory in Wolfsburg or the Working Group Hybrid Lightweight Technologies within the Germany’s mechanical engineering association, VDMA. We must be on the leading edge to be able to define the course of machine development. At the end of the day, OEMs will also benefit from having access to equipment specifically tailored to their own needs.

FÜRDER: The structures will also change in sales. New business models will emerge that we need to adapt to. Maybe we will stop selling machines in the future, and start selling availabilities.

FISCHER: But the focus will definitely shift even more away from the machine and towards the complete production cell. From material development, through prototype moulds, to the processing technology, we need to develop more and more in parallel. At least the development cycles are becoming shorter in the vehicle interiors field. We can only build on this momentum if we join forces in networks and have strong partners who share our philosophy. At the end of the day, it is the people who will collaborate more closely. This will be an exciting future, and one that I am very much looking forward to.

“We need to develop more and more in parallel and need strong partners who share our philosophy to do this.”
Michael Fischer, Head of Business Development Technologies

“It is conceivable that data management will be more important in the future than actual vehicle construction.”
Franz Füreder, Vice President, ENGEL automotive

“There can be no doubt that plastics and injection moulding make a huge contribution to more sustainable mobility.”
Peter Egger, Director of the ENGEL Centre for Lightweight Composite Technologies
Performance and precision – layer by layer

Processing thermoplastic fibre composite materials requires efficient processes and automated manufacturing cells. The first processes for producing thermoplastic fabric components have reached the series production stage. The focus of further development is now on solutions for thermoplastic tapes with glass and carbon fibre reinforcements. ENGEL is also collecting experience in its own production. The e-pic series of robots have a lightweight design carbon arm.

Thermoplastic fabrics have a pioneering role in the processing of thermoplastic fibre-reinforced composite materials. In both the automotive and the sporting goods industries, series products are now being manufactured in large quantities. However, in the field of tape laying, thermoset processing points the way. Pre-impregnated, rolled, and unidirectionally reinforced fibre composite materials, which are offered as pre-pregs, have established themselves. Thermoplastic variants of these tapes using PA, PP, PE, PC-ABS, PPS, and PEEK matrices have only made significant gains recently. They can be processed faster, but require an entirely different process technology, which in turn has significant parallels with the processing of thermoplastic fabrics.

Thermoplastic fabrics consist of one or more layers of fabric materials. For processing, they are heated in a controlled manner using an infrared furnace and then inserted into the injection mould, where they are re-formed, reconsolidated and functionalised by injection moulding. In contrast to the thicker, mostly multi-layered thermoplastic fabrics, tapes with carbon and glass fibre reinforcements have a thickness of just 0.14 to 0.30 mm, which is not sufficient for most applications. Instead, layups are built from up to 20 tape layers.

Tape layups in the processing cycle

Layout design is part of the component design. The objective is to achieve optimal performance using as little material as possible. It is not always possible to combine lightweight design and economic feasibility. While the optimal design of the mechanical structure leads to a layup with many small tapes, their arrangement and number based on the load path must be limited to a practical level for economical production. Therefore, considerations relating to the productivity of the entire system are made at an early stage of process development. With a cycle time of approx. 60 seconds for the injection moulding process, and 20 tapes to be processed, the main requirement for a tape laying cell is that it needs to lay tapes, and spot weld them together, at intervals of 3 seconds. ENGEL’s conceptual approach to meet this requirement is based on the pick-and-place principle, where the bulk tape is created in an upstream custom manufacturing step.

Component design reflects the load

The pick-and-place method developed by ENGEL for processing tapes is used in-house in robot manufacturing. The e-pic robots, which are offered as either pick-and-place robots (e-pic Z) or sprue pickers (e-pic B), have a lightweight design X axis. This is a rotary axis,
where weight reduction results in a significant increase in performance. Thanks to this innovative manufacturing technology, ENGEL has succeeded in reducing the weight of the robot axis by 37 percent. Therefore, the robot’s movements can be significantly faster and require less energy.

The design of the rotary axis was driven by structural-mechanical performance (lightweight design effect) and low tooling costs. A solution was selected that involved creating the component from two identical half-shells, which are joined to create a closed profile during final assembly.

The majority of tapes used are inserted longitudinally to the axis of rotation in order to meet the high stiffness requirements. In addition, several layers of tape are laid at an angle of +/-45° and 90° to the longitudinal axis. The most favourable design for the required load cases was determined using FEM calculations. Celanese and Schöfer were partners in this project.

**Precision in the laying process**

Four different tape formats are required for the rotary axis. A half-shell consists of 32 individual, unidirectional reinforced tapes. To achieve the required high dynamics in the laying process, fast articulated-arm robots are used. The tapes are retrieved from the magazines as needed, regardless of the actual laying process, so that the deposit speed of the robot is not reduced by slow removal operations.

The quality of the tape layup depends significantly on the precision of positioning the tape. Where tapes overlap, pronounced fibre displacement occurs during the consolidation phase; i.e., the fibres shift sideways to compensate for local thickness differences in the tape layup. If the tapes are laid with a spacing, linear areas without fibres occur during consolidation that have a reduced stiffness and strength. In contrast to thermoset tape layups, the gap between the tapes often does not fully close during consolidation because the viscosity of the thermoplastic matrix is higher than that of, for example, epoxy resin. It is therefore essential to lay the tapes precisely despite a high deposit speed. Often positioning accuracies with gap widths or overlaps of 1.0 mm are required, and in some cases even less than 0.5 mm. ENGEL uses fast, high-resolution camera technology to detect and compensate for errors and lack of precision.

The laying technology, with optical image processing and depositing based on the pick-and-place method, is highly flexible. The bulk tape can have almost any contours and sizes. This means that layups can be custom-made. Because the layups are given the shape required for the component during laying, functionalisation can occur after consolidation in the injection moulding step without the need for intermediate trimming.

The process for manufacturing the rotary axes consists of six steps: building the layup (tape laying cell), consolidating the layup (heating/cooling press), heating the layup (IR heater), forming (reforming station), trimming (water jet cutting machine) and assembly (gluing station).
Welcome to the ENGEL stand at Fakuma 2017

In October in Friedrichshafen, Germany, ENGEL will be opening up new horizons for the injection moulding industry. The highly integrated manufacturing solutions at the ENGEL exhibition stand achieve an even higher degree of quality, efficiency and profitability – respectively tailored to the specific requirements of the various application industries.

Automotive: clearmelt for exterior components
At the Fakuma, ENGEL and its clearmelt technology will be opening the door to a new application area. The focus so far has been on decorative elements and electronic functional components for the interior of the vehicle; at this time, automobile manufacturers are also becoming interested in using the technology to produce exterior components.

High gloss exterior panels will be produced on an ENGEL duo 2460/500 injection moulding machine. In addition to the extremely high quality appearance of the components and the outstanding efficiency of the highly integrated process, extremely scratch-proof surfaces are another advantage that clearmelt technology provides for the exterior area. Testing in a car wash has shown the initial sample parts to be very robust. In the clearmelt process, at first a thermoplastic base carrier is produced in the injection moulding machine, then coated with polyurethane in a second cavity.

Teletronics: Premiere for the new e-mac 280
ENGEL will be going all-electric at the Fakuma in the teletronics exhibition area. Sophisticated connector housings for vehicle doors will be produced on an ENGEL e-mac 940/280. Until now, the e-mac series has been available with clamping forces of up to 1800 kN. In time for the Fakuma, ENGEL has expanded the line with a 2800 kN version.

e-mac machines are distinguished by their speed and precision, extremely energy efficient operation and a high degree of flexibility. They have proven themselves to be extremely reliable in continuous operation, and guarantee stable production around the clock. They are also less expensive to purchase than all-electric high-performance machines. This spectrum of characteristics predestines the series for the production of technical parts and electronic components. In both application areas, the trend is moving towards larger moulds with higher cavitation. With the expansion of the series, ENGEL has taken this trend into account. In this market segment, due to the very filigree structure inside the connector housing, the competitiveness of the producer is defined by the precision of the injection moulding process. In several sequential process steps, the connector housings are equipped with stabiliser inserts, gaskets and contacts. Imprecisely injected areas or warping will impede the automated assembly. Since injection errors often are not detected until the end of the process chain, rejects also become more costly. To prevent this, the e-mac machine makes sure that very thin-walled areas are filled, even across long flow paths.
With the intelligent assistance systems from ENGEL’s inject 4.0 programme, the already very reliable e-mac machines are also perfectly equipped for process fluctuations through external influences.

Medical: Pipe distributor fits completely into the safety gate

Highly integrated, compact production cells minimise the system footprint and increase area productivity. These aspects really pay off in the cleanroom. For this reason, ENGEL redeveloped the stainless steel pipe distributor for the cavity specific handling of small injection moulding parts, which it introduced two years ago, so that the handling system now fits completely into the expanded safety gate of the injection moulding machine.

During Fakuma, an ENGEL e-victory 170/80 injection moulding machine will be producing needle holders for 1-ml safety syringes in a 16-cavity mould by Fostag. An ENGEL viper 12 linear robot will remove the filigree polystyrene parts from the mould and transfer them to the distribution system. In order to ensure batch traceability, the injection moulded parts will be packed in cavity-specific bags. For this purpose, 16 bags are hung in a cart located directly beneath the pipe distributor. For unmanned cleanroom operation two carts can be alternated in sequence.

Technical Moulding: Hydraulic precision for sophisticated LSR

The processing of liquid silicone (LSR) in injection moulding fully utilises the efficiency potential of the tie-bar-less ENGEL victory machines. The process consistency resulting from the design plays an important part in this. Both the outer and inner cavities are therefore kept closed with exactly the same force, ensuring consistent compression of the mould and a consistently high product quality. This almost burr-free, zero-waste, rework-free, and fully automatic processing is the key element in the economic manufacturing of high-tech products from liquid silicone. At the Fakuma, with the production of venting valves for beverage bottles on an ENGEL victory 860/160 injection moulding machine, ENGEL will demonstrate how this can look in practice. The venting valves have a geometrically complex structure with varying wall thicknesses.

ENGEL is presenting the processing of LSR, together with its partner Elmet Elastomere Produktions- und Dienstleistungs GmbH. Elmet is providing the model OP 5000P LSR dosage system, a 16-cavity mould with a cold runner and demoulding unit.

ENGEL viper 20 robot: now even faster

At Fakuma, ENGEL will present the new speed version of its viper 20 linear robot for the first time. The viper 20 speed offers removal times of well under 1 second.

In 2009, ENGEL introduced the viper series to the market. Right from the start, the robots set new standards in terms of performance and efficiency thanks to their innovative design features and intelligent software packages. With the new viper 20 speed, ENGEL is now even better able to meet the requirements of the packaging and medical sectors in the area of small and medium-sized machines. ENGEL managed to increase dynamics by more than 30 percent compared to the traditional viper 20. The new ENGEL viper 20 speed will demonstrate its impressive performance by handling cups at the Fakuma event. It will work in tandem with an ENGEL easix multi-axis robot that will take the cups from a moving conveyor belt and stack them.
Industry 4.0 has arrived in the injection moulding industry. At Fakuma, ENGEL demonstrates how its potential can be best utilised. Visitors to the trade fair are invited to try out the inject 4.0 products for themselves on the live production machines as well as in the various Expert Corners, and discover a whole new range of possibilities.

smart machine: Milestone for secure data exchange
With production cells becoming more and more complex due to increasing process integration and automation, controlling them must become that much more simple. Self-adapting assistance systems play a decisive role in this. They increase process consistency and quality without requiring the machine operator to acquire special expertise.

To clearly demonstrate the functionality of these solutions, during the five days of the exhibition ENGEL will be producing inject 4.0 logos on an ENGEL e-motion 80 TL injection moulding machine. The CC300 machine control is capable of simulating process fluctuations; the automatic readjustments by the intelligent assistance systems can then be tracked on the display of the machine. While iQ weight control maintains consistent injected melt volume throughout the entire injection moulding process, iQ clamp control monitors the mould breathing in order to calculate and automatically adjust the optimal clamping force.

iQ weight control was the first of the ENGEL iQ systems to enter the market. To date, it has been sold more than 1,500 times worldwide. New for Fakuma 2017 is iQ clamp control now also offered for the large hydraulic machines of the duo series.

iQ flow control, the third assistance system presented at Fakuma, connects the injection moulding machine, which is equipped with the e-flomo electronic temperature control water distributor, to the temperature control unit, thus enabling the pump speed to automatically adjust to the actual requirement. This results in higher energy efficiency. Together with its partner HB-Therm, ENGEL has developed its own line of temperature control units of the duo series.

At the Fakuma, all of the injection moulding machines at the ENGEL booth will be networked through authentig. ENGEL will also demonstrate how easily MES can ensure the seamless traceability of process parameters. All of the inject 4.0 logos produced during the trade fair will be marked with a QR code. Even long after the Fakuma, trade-fair visitors will be able to use this code to retrieve the process data stored by authentig for each individual part.

smart service: New e-connect portal being launched
In order to increase the availability of machines and production cells, smart service relies on online support, remote maintenance, and predictive, condition-based maintenance. As of the Fakuma 2017, all ENGEL’s smart-service products will be integrated into the e-connect customer portal. This simplifies and accelerates the communication between the processors and ENGEL, and provides a time- and location-independent overview of machine status, the processing status of service and support orders, and the prices and availability of spare parts. To meet the new demands of Industry 4.0, ENGEL has redesigned its customer portal from the ground up. e-connect.monitor is now also integrated with the platform. For the first time, econnect.monitor is making it possible to monitor the condition of critical injection moulding machine components in real time, and to calculate their remaining useful life.

smart production: Deep vertical data integration
In the Expert Corner for smart production, the focus is on MES authentig. Tailored to the specific requirements of the injection moulding industry, authentig offers particularly deep vertical data integration.

The shortest route into the world of ENGEL: The new customer portal e-connect.
iQ weight monitor
takes process monitoring to a new level

A number of operating figures are obtained during injection moulding, some of which have greater relevance than others for monitoring and optimising processes. For example, the commonly used “material cushion” and “flow number” indicators are able to specify changes in the process, but they do not allow conclusions to be drawn on the causes or effects of the changes. Compared to these, the indicators determined by iQ weight monitor, “injection volume”, “change in viscosity” and “conformance of pressure profile”, allow conclusions to be made about the expected component quality. As of FAKUMA 2017, the monitoring software will be a standard feature of all ENGEL machines.

In the development of iQ weight monitor, ENGEL investigated cavity filling in particular. The machine operator specifies a starting position, a speed profile and a switchover point as set values for the screw movement in the speed-controlled filling phase. The machine control unit calculates a set value from this, which the injection controller then meets as precisely as possible. Apart from the speed, the resulting injection pressure profile depends on the melt volume in the screw ante-chamber, the flow characteristics of the material, and the flow resistance along the nozzle, hot runner and cavity. Due to the large number of influencing factors, the injection pressure profile is characteristic for the respective application – and therefore unique. Fluctuations of one or more factors occurring in practice not only affect the quality of the moulded part, but also change the pressure profile. This makes the pressure profile suitable for indirect quality monitoring.

Meaningful operating figures
The injection volume is the key operating figure for the iQ weight monitor, since it is directly related to the actual shot weight. It takes into account the fact that more or less material is fed into the cavity due to differences in the non-return valve closing behaviour. The second factor, the viscosity change, is meaningful because the viscosity determines the melt flow characteristic on which, in turn, the injection volume depends. Viscosity changes can result from fluctuations in material batches, recycled material content, moisture content or temperature changes. Thirdly, the conformity of the pressure profile with the reference curve offers valuable insights into the existence of other interference factors during injection. A strongly fluctuating value can mean, for example, that the process has not been set up correctly, or that a cold plug has formed in the nozzle.

Low overhead, great benefits
The use of iQ weight monitor is simple. The user first optimises the process, in the usual way, to achieve the desired component quality. Then, they start the reference measurement at the press of a button, thus stipulating that they want to save the current status as the setpoint. Because iQ weight monitor has already calculated the characteristic values during injection, the system offers the opportunity to compensate for deviations from the desired values within the same cycle, thus proactively preventing rejects. This inline control is handled by the iQ weight control software. The extent to which iQ weight control can improve reproducibility depends on several factors. Naturally, processes which are already very stable, cannot be further optimised – or only to a lesser extent. To assess what additional effect iQ weight control would have, iQ weight monitor calculates the potential improvement achievable with iQ weight control.
Huf produces support brackets for various Mercedes models at three sites on three continents, using the MuCell process. To achieve the high productivity and quality standards common to all sites safely, the tier 1 supplier relies on teamwork between its employees at all three sites and on worldwide connectivity of its injection moulding machines with the help of innovative Industry 4.0 technologies. One close companion of the company on its way to becoming a smart factory is the injection moulding machine builder ENGEL.

The support brackets are mounted in the doorjamb of the vehicle and used to fasten the door handle. They are complex sub-assemblies consisting of up to 40 different components, which the company Huf Hülsbeck & Fürst GmbH & Co. KG, headquartered in Velbert, Germany, delivers fully assembled. Huf being the sole supplier for many car models, high process consistency and high machine availability are central requirements when the international automotive supplier invests in new manufacturing solutions.

For the bracket project, ENGEL delivered the initial injection moulding machine with MuCell technology package a little more than two years ago, which was installed at the company’s site in Arad, Romania. It was followed by two further ENGEL e-victory 400 MuCell machines, first for the site in Puebla, Mexico and then for the site in Yantai, China.

All three machines now work in series production. Two brackets for the right car door and two for the left car door are manufactured in 2+2-cavity moulds per shot. In spite of its experience in worldwide automotive projects, it was also a new challenge for Huf to manufacture in unison on three continents. It was clear from the start that this could only be achieved successfully with new technologies in data networking.

For the first time in the group’s history, the three new e-victory machines were equipped with ENGEL’s online support and remote maintenance tool e-connect 24.

"It was the first MuCell project for all three sites," say Ralph Müller and Dirk Horn, both of Corporate Process Technology at Huf. "At the start of the project, the knowledge of our colleagues at the sites was heterogeneous. In some areas we had to build up our know-how in MuCell from scratch." In the event of a fault, it is also hardly possible for the two process experts to be on site quickly, and Huf cannot afford machine downtimes. "Machine availability of 85 percent is the minimum – otherwise we are not competitive," says Müller. "Without data connection between the production cells, we cannot guarantee the high machine availability that we need to deliver the quantities we have promised."

Connectivity ensures minimal machine downtimes
Connectivity means two things for Huf: Firstly, it is important for Ralph Müller and Dirk Horn to be able to keep an eye on the processes running worldwide at all times, regardless of where they are running. And secondly, Huf wants it to be possible for the machine and technology experts from ENGEL to remote connect in order to respond without delay in all support
cases. As a result, it is now possible to deal with the majority of faults as well as maintenance and process optimisation measures very simply over the internet and telephone, for which long business trips or on-site service assignments used to be necessary.

With the help of e-connect.24, the screen pages of the machine control unit are transferred via the internet to a computer, which can be several thousand kilometres away. Since the data are accessed in real time, the current state of the machine can be displayed whenever needed. As a result, the machine operators on the ground and external support staff can see the same settings and production data and can consult and guide each other. The manufacturing cell can even be controlled remotely when necessary.

TÜVİT-certified data security

The online support and remote maintenance tool e-connect.24 is an important pillar in ENGEL’s inject 4.0 program for the digitalisation and connectivity of manufacturing processes. In the case of assistance systems or networking of the machinery via an MES, only the plant operator can see and use the machine and process data in the machine control unit. In contrast, online support and remote maintenance presuppose that ENGEL, as the supplier, can access a particular machine remotely. “Many customers are still suspicious about this,” says Udo Riethmüller, Sales Engineer for ENGEL Germany at its site in Hagen, and he is also aware that more than mutual trust is needed for this new form of collaboration. Of utmost importance is that the data are encrypted securely for transfer. ENGEL further guarantees that its service technicians will not access the data unasked, but only after an active request from the customer. Both are confirmed by TÜVİT, where ENGEL had e-connect.24 certified. “ENGEL invests very heavily in the subject of data security,” says Riethmüller. “We are not only a supplier, but also a user of Industry 4.0 technology, and we also do not want it to be possible for someone to access our data unasked.”

For Huf, data security played a central role in the negotiations with ENGEL. “We manufacture complete locking systems up to basic programming of the car keys,” Horn explains, “We must prove to our customers that their data are safe with us and that the systems used for digitalisation and connectivity are state of the art.”

International transfer of knowledge

When Huf was awarded the contract by Daimler, the subject of foam injection moulding was certainly not something new for the technology experts Müller and Horn. The first MuCell processes were already implemented at other sites in the group back in 2004. The two process experts pass on the experience gained from these projects to their colleagues in Arad, Puebla and Yantai. The company’s machine manufacturing partner ENGEL also plays an important role in technology training. Huf employees in Romania, Mexico and China have attended seminars at the respective ENGEL subsidiaries. Of particular importance for the success of the project is, however, the joint meetings that have taken place three times so far at ENGEL in Austria. These meetings not only focussed on a transfer of knowledge, but also on sharing experiences. “It is our aim that the three teams grow together in spite of the immense distances between them, so that they can support each other evermore closely,” says Müller.

The international workshops at the ENGEL headquarters in Schwertberg are led jointly by ENGEL and Trexel, the inventor of the MuCell technology. Apart from in Schwertberg, ENGEL also runs numerous technology centres focussing on MuCell in Europe and North America. It plans to open a MuCell technology centre in Shanghai next.

Ralph Müller, Dirk Horn and Udo Riethmüller have worked together for more than 12 years. All three are sure that their partnership will become even more intensive as a result of Industry 4.0. For the automotive supplier, the use of e-connect.24 is one of the first steps towards a digital and connected future. “With this project, we have seen how the new solutions have helped us not only to reduce our travel times, but also to manufacture better and more productively. All of this strengthens our competitiveness significantly,” says Horn. “We are already planning further Industry 4.0 projects with ENGEL.”

Noe Resendiz took a wealth of practical knowledge home with him to Mexico from the technology workshop in Schwertberg.
The Volkswagen Jetta and Sagitar are among the best-selling cars in China. The two mid-range cars are produced locally, with a large proportion of the necessary components supplied by Faway Johnson Controls Automotive Systems Co., Ltd. Components for car interiors that demand high precision are produced using injection moulding machines from ENGEL.

"When we need to produce very sophisticated parts, we turn to ENGEL," explains Hui Zhang, Manufacturing and Engineering Manager at Faway in Chengdu, on a visit of the Injection editorial team in China. One example would be dashboards – not just because this is a visible component, but also because dimensional accuracy determines the reliability of airbags.

Faway Johnson Controls Automotive Systems was founded in 2001 as a 50/50 joint venture between Faway Automotive Components and Johnson Controls Asia. The headquarters is in Changchun. The city in the extreme northeast of the People's Republic is the cradle of the Chinese automobile industry. It is home to FAW (First Automotive Works), the state-run enterprise that was the largest car maker in China for a long time. There at its main base, Faway takes strategic decisions that also apply to its Chengdu site, nearly 3,000 kilometres away in central China. The majority of the 2,000 people working in the Chengdu factory spanning 50,000 square metres are involved in the assembly of vehicle seats. Another, somewhat smaller production area is the injection moulding plant, which specialises in interior components. Dashboards for the Jetta and door modules for the Sagitar are produced here, amongst other things. Of the 16 injection moulding machines installed in the plant, nine were supplied by ENGEL: seven large-scale, dual-platen duo machines with clamping forces from 9,000 to 32,000 kN and two duo combi M machines each with clamping force of 15,000 kN.

Consistent processes, high repeatability
"The duo machines ensure very consistent processes and high levels of reproducibility," says Jie Li, Manufacturing Engineer at Faway. This is particularly important for dashboards with airbag covers. In the area of the airbag, the 1.4 metre, single-piece components moulded out of polypropylene are somewhat stronger than in other areas. The transition from thin to thick is especially critical as this is the predetermined breaking point that governs whether the airbag opens at the right time in the event of an accident. "Tolerance for this wall thickness is +/- 0.2 mm," explains Li. "If it is too thin or too thick, the airbag may not work properly."

Two injection moulding processes at once
To combine very high quality with a high degree of cost effectiveness, Faway works with ENGEL as a partner.
with a view to optimising its production processes progressively. The pair of duo combi M injection moulding machines also make a major contribution to high production efficiency. Both machines are used to produce door panels for the left and right doors of the Sagitar simultaneously.

“The injection moulding machines in the duo combi M series have two injection units and a very long mould area,” says Vincent Feng, Area Sales Manager at ENGEL Machinery (Shanghai) responsible for customers in central China. The two injection units are arranged horizontally; one is located on the fixed mould mounting platen while the other is located on the moving mould mounting platen. To produce two large components simultaneously, Faway uses a stack mould with two parting lines. Both parts call for precisely equal clamping force that only needs to be built up once in the combined process. “With duo combi M technology, we require much less energy than when we would if we produced the two components separately on two injection moulding machines,” says Li. “Also, the fact that we need fewer machines overall cuts our investment costs and saves space.”

When the mould opens, the integrated ENGEL viper 60 linear robot removes the two components and places them on a conveyor belt. The robot can be operated via the display of the injection moulding machine, which simplifies the process. ENGEL supplies the injection moulding machine and robots from a single source, with the two system components accessing a shared database and ideally coordinating their movements to maximise overall efficiency.

“Automation is becoming increasingly important to us,” emphasises Hui Zhang, “and we are planning even more automation in the future.” Rising wage costs were not the main consideration in this decision. Instead, the manager is aiming to use robots to achieve more stable processes, higher quality and faster cycle times. “As far as door module production is concerned, automation makes the process 10 to 15 seconds faster than removing components manually,” says Li, citing one example.

Customer proximity raises productivity

The benefits that Faway derives from the use of duo injection moulding machines include higher precision, more stable processes and greater efficiency. Another reason for working with ENGEL was the machine manufacturer’s strong presence in China; the duo machines are produced at the ENGEL plant in Shanghai. “This means we can deliver faster than many other European suppliers,” explains Feng. Another advantage of local production is the fact that ENGEL can meet the specific needs of clients in China with a high degree of flexibility. ENGEL’s service network extends across the country, and the company is boosting its application-specific expertise in China – two factors that are becoming more important. The trend towards more automation and process integration and the increasing use of innovative process technologies calls for ever closer collaboration between ENGEL and its customers. “The shorter the distances, the more frequently we can visit our clients and the better we can support them in terms of ongoing process optimisation,” says Jenny Liu, Sales Support Engineer at ENGEL Machinery (Shanghai).

One area in which Faway is already heavily involved is lightweight construction technology. “Our colleagues in Changchun are already working with MuCell,” says Jie Li. “I hope we will soon be introducing foam injection moulding at our site.”

The plastic parts undergo a quality test before shipment to the China Volkswagen plant.
Prefillable syringes made of COC – a niche market with potential

The SCHOTT Group has been known for glass for around 130 years. What is less well known is that the company has a polymer business line. In St. Gallen, Switzerland, prefillable syringes are produced from the high-tech plastic COC under the TopPac brand using ENGEL injection moulding machines.

Glass still has a clear edge in the market for prefillable syringes. About 3.6 billion prefillable syringes are manufactured worldwide – the bulk of which are made of glass. The plastic syringes are usually made of PP, with a relatively small number made of COC (cyclo olefin copolymer) or COP (cyclo olefin polymer). “The COC/COP volume is – I wouldn’t call it small, but manageable. We serve a niche market in the ‘prefillable syringes’ segment,” says Tom Van Ginneken, Global Product Manager at SCHOTT.

There are various reasons that prompt a pharmacist to opt for a COC product: the material is inert, bio-compatible and exhibits low protein absorption. Compared to glass, polymers have the advantage that they avoid contact with heavy metals during processing and thus also the risk of becoming contaminated. Compared with PP, COC has 10 times higher barrier properties against both moisture and oxygen. One huge advantage over glass is the break-resistance. Additionally, COC has the same optical properties as glass; PP is dull in comparison. “One advantage of COC is the design freedom. The thread can be created with high precision using injection moulding technology. You can’t do that with glass”, as Jens Meiss, a process engineer at SCHOTT explains, pointing out another benefit.

Where COC substitutes for glass

SCHOTT supplies ready-to-use, prefillable syringes to the customer. “The pharmacist can immediately add the product in their lab. The trend is clearly heading in this direction”, as Van Ginneken explains. In syringes made of COC, a drug remains stable for three years and retains its effectiveness, thanks to the excellent barrier properties.

Van Ginneken cites two examples, where COC syringes are increasingly replacing glass or PP syringes: hyaluronic acid is a substance that occurs naturally in the body, and ensures a better healing process. Administered as medicine, hyaluronic acid is highly viscous. Previously, the drug was filled into glass syringes and the cannula connected with a Luer lock. There was
a danger of the unit dropping off at high pressure. In the TopPac syringe, the thread is integrated and flatter. The cannula can therefore be screwed to a greater depth, which increases the holding force – and thus the safety for the patient.
The second example comes from the infusion market, a large market for syringes. Usually, the disposable syringes are prepared by the hospital staff: the vials need to be decontaminated and sterilised, and the correct volume drawn into the disposable syringe – thus creating sources of risk and error which prefillable syringes avoid.

The step to an integrated solution
Following the increase in demand for prefillable syringes, the question of capacity expansion and a generation change of the injection moulding machines arose for SCHOTT. “This prompted us to look at the market to determine who could deliver the best integrated solution for our production. ENGEL made this easy for us. In 2015 we purchased the first system with an integrated robot and in May of this year we ramped up our fully automated production line,” as Michael Feldhaus, Head of Sterile Technology explains, going on to add: "The flexibility provided by the modular design of the large-scale machine won us over. We can cover the complete portfolio."
The line concept allows SCHOTT to raise the quality to a level which, according to Technical Director Helge Perkampus, is not currently achieved by the competition. The system is used with a 32-cavity mould to manufacture highly transparent COC syringes and to siliconise the interior top of the syringe in order to achieve the required non-stick properties. The cap is then applied before the syringes are nested, sealed, bagged and (externally) sterilised.
The recently delivered injection moulding machine is a clean room version of the ENGEL e-motion 940/220 T including automation. All 32 syringes are removed at the same time and deposited separately. “The requirements were utmost precision, cleanliness and efficiency, meaning short cycles. That’s why we decided to offer the e-motion machine. As the movements here are all-electric, we can raise precision to a new level compared to the previous production. This guarantees the highest reproducibility”, as Markus Schertler, the Managing Director of ENGEL Switzerland explains. GMP documentation by ENGEL provides proof that the strict requirements of the medical industry are met. “The new machine is located in an ISO class 7 clean room. In the area where the syringes are removed, we work with laminar flow and comply with ISO class 6”, as Mr. Perkampus added.

Tie-bar-less prototype machine
SCHOTT started working with ENGEL machines two years ago with an e-victory 170/80 featuring an integrated ENGEL easix multi-axis robot for sampling and small series. “We produce prefillable COC syringes on the e-victory under the same process conditions as we have with our large-scale system, allowing us to expand our expertise and capabilities. The tie-bar-less design is ideally suited for the robot as it has more room to move in and out”, as Mr. Feldhaus explains.

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Excited about the new production cell: Michael Feldhaus, Jens Meiss, Helge Perkampus, Tom Van Ginneken von SCHOTT and Markus Schertler from ENGEL. (left to right).
Global customer satisfaction survey in October 2017

ENGEL has one goal: to be the world market leader in generating customer value. And your satisfaction is our yardstick.

To obtain an important evaluation of your satisfaction level, we are conducting a global customer satisfaction survey. Take advantage of this opportunity. You will receive an invitation to take part in the digital survey in October 2017.

Your feedback will help us to improve for your benefit. Because your satisfaction is our motivation to become just that little bit better.